

# PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2000-228826

(43)Date of publication of application : 15.08.2000

(51)Int.Cl.

H02J 3/18

H02J 3/01

H02J 3/32

(21)Application number : 11-027286

(71)Applicant : UNIV OSAKA

(22)Date of filing : 04.02.1999

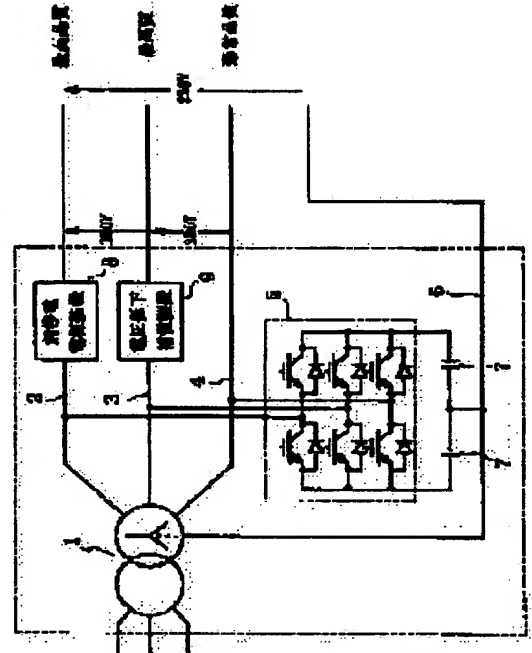
(72)Inventor : TSUJI KIICHIRO  
ISE TOSHIFUMI

## (54) POWER SUPPLY DEVICE ACCORDING TO QUALITY

### (57)Abstract:

**PROBLEM TO BE SOLVED:** To provide a power supply device according to quality, capable of inexpensively supplying power according to quality especially to single-phase loads which account for the majority of loads.

**SOLUTION:** The power supply device is according to quality provided with an inverter 5 of three-phase bridge constitution, having alternating-current output terminals connected to distribution lines 2, 3, and 4 in the respective phases of three-phase, four-wire alternating current, capacitors 7 and 7 connected between the two input terminals of the inverter 5 on the direct current side and a neutral line 6, respectively, an uninterruptible power supply means 8 which is inserted in a distribution line 2 in one phase, between the connecting point of the inverter 5 to the distribution line and a load, and compensates for the voltage drop and power failure in the distribution line 2, and a voltage drop compensating means 9 which is inserted in a distribution line 3 in specified another phase, between the connecting point of the inverter 5 to the distribution line and a load, and compensates voltage drop and power failure in the distribution line 3. The phases of the inverter 5 are independently controlled, so that power which different in quality is supplied to single-phase loads connected between a neutral line 6 and the distribution lines 2, 3, and 4, respectively.



## LEGAL STATUS

[Date of request for examination]

04.02.1999

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

2997782

[Date of registration] 05.11.1999

[Number of appeal against examiner's decision  
of rejection]

[Date of requesting appeal against examiner's  
decision of rejection]

[Date of extinction of right]

\* NOTICES \*

JPO and NCIPi are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

---

CLAIMS

---

(57) [Claim(s)]

[Claim 1] The inverter of the three phase bridge configuration which has the alternating current output terminal connected to the distribution line of each phase of a three-phase-four-wire-system alternating current, The capacitor connected between each of two input terminals by the side of a direct current of this inverter, and the neutral-line way of the above-mentioned three-phase-four-wire-system alternating current, While being inserted in the distribution line of one predetermined phase by the side of a load rather than the node to the distribution line of the above-mentioned inverter and compensating the sag of the distribution line concerned It is inserted in the distribution line of other one predetermined phases by the side of a load rather than the node to an uninterruptible power source means to supply electric power to the distribution line concerned in a predetermined electrical potential difference at the time of interruption of service, and the distribution line of the above-mentioned inverter. Power supply according to quality characterized by having a sag compensation means to compensate the sag of the distribution line concerned, having controlled independently each phase of the above-mentioned inverter, and constituting so that the power with which quality differs to the single phase load connected between each of a neutral-line way and the distribution line of each phase may be supplied.

[Claim 2] The inverter of the three phase bridge configuration which has the alternating current output terminal connected to the distribution line of each phase of a three-phase-four-wire-system alternating current, The capacitor and rechargeable battery which were connected to juxtaposition between each of two input terminals by the side of a direct current of this inverter, and the neutral-line way of the above-mentioned three-phase-four-wire-system alternating current, It is inserted in the distribution line of one predetermined phase by the side of a power source rather than the node to the distribution line of the above-mentioned inverter, have the switching means which intercepts the distribution line concerned at the time of interruption of service, and each phase of the above-mentioned inverter is controlled independently. Power supply according to quality characterized by constituting so that the power with which quality differs to the single phase load connected between each of a neutral-line way and the distribution line of each phase may be supplied.

[Claim 3] The above-mentioned switching means is power supply according to quality according to claim 2 characterized by having a thyristor switch.

---

[Translation done.]

\* NOTICES \*

JPO and NCIPi are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

---

DETAILED DESCRIPTION

---

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the power supply according to quality which supplies the power of the quality adapted to the demand of a load.

[0002]

[Description of the Prior Art] Electrical energy is widely used from handling being easy, and the electric power supply is carried out to the current emergency at high quality. However, although quality, such as an electric heat application, is not required depending on a load, what can permit neither momentary sag, such as a thing, a computer, etc. which ask for low cost, nor interruption of service is various. Moreover, in recent years, from the inclination of the deregulation in the spread of natural energy generation-of-electrical-energy systems, such as photovoltaics and wind power, and a dispatch power distribution system, photovoltaics equipment etc. is installed in a home and the regeneration power from photovoltaics equipment etc. is further supplied to a power distribution system increasingly.

[0003] Since it is such, the electric power supply approach classified by quality which supplies the power of the quality based on the demand of a load from the society etc. as a new view of a power distribution system is proposed.

[0004]

[Problem(s) to be Solved by the Invention] By the way, in performing the electric power supply according to quality, the cost of the system for carrying it out poses a problem. That is, when all the paths from an electric power plant to a consumer through power-transmission wires and service wires are made to correspond according to quality and are established, the cost of a system will go up extremely and the cost of power will also go up in connection with it. [ two or more ] Moreover, there is \*\*\*\* which also causes the power surge of the distribution line and the frequency drift of a network by the head-tide style as photovoltaics equipment etc. increases. Furthermore, it is in the inclination for a higher-harmonic current to flow for a network and for the electrical potential difference of a network to be distorted for a nonlinear load.

[0005] This invention solves many problems of a power distribution system mentioned above, and aims at offering the power supply according to quality appropriately constituted so that the power according to quality could be cheaply supplied to the single phase load which has especially the large majority of a load.

[0006]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, invention of the power supply according to quality concerning claim 1 The inverter of the three phase bridge configuration which has the alternating current output terminal connected to the distribution line of each phase of a three-phase-four-wire-system alternating current, The capacitor connected between each of two input terminals by the side of a direct current of this inverter, and the neutral-line way of the above-mentioned three-phase-four-wire-system alternating current, While being inserted in the distribution line of one predetermined phase by the side of a load rather than the node to the distribution line of the above-mentioned inverter and compensating the sag of the distribution line concerned It is inserted in the distribution line of other one predetermined phases by the side of a load rather than the node to an uninterruptible power source means to supply electric power to the distribution line concerned in a predetermined electrical potential difference at the time of interruption of service, and the distribution line of the above-mentioned inverter. It is characterized by having a sag compensation means to compensate the sag of the distribution line concerned, having controlled independently each phase of the above-mentioned inverter, and constituting so that the power with which quality differs to the single phase load connected between each of a neutral-line way and the distribution line of each phase may be supplied.

[0007] According to invention of claim 1, to the distribution line where unbalance and a higher harmonic could be compensated to the distribution line of each phase, and sag and interruption of service could be compensated to the distribution line where the uninterruptible power source means was connected further, and the sag compensation means was connected, sag can be compensated by controlling each phase of an inverter independently. Therefore, it becomes possible for a sag compensation means to supply the power of high quality in the distribution line where the power of the highest quality was connected, and to usually supply the power of quality in the distribution line of the one remaining phases, respectively in the distribution line where the uninterruptible power source means was connected.

[0008] Invention of the power supply according to quality according to claim 2 The inverter of the three phase bridge configuration which has the alternating current output terminal connected to the distribution line of each phase of a three-phase-four-wire-system alternating current, The capacitor and rechargeable battery which were connected to juxtaposition between each of two input terminals by the side of a direct current of this inverter, and the neutral-line way of the above-mentioned three-phase-four-wire-system alternating current, It is inserted in the distribution line of one predetermined phase by the side of a power source rather than the node to the distribution line of the above-mentioned inverter, have the switching means which intercepts the distribution line concerned at the time of interruption of service, and each phase of the above-mentioned inverter is controlled independently. It is characterized by constituting so that the power with which quality differs to the single phase load connected between each of a neutral-line way and the distribution line of each phase may be supplied.

[0009] According to invention of claim 2, since the rechargeable battery other than a capacitor is connected between each of two input terminals by the side of a direct current of an inverter, and the neutral-line way of a three-phase-four-wire-system alternating current, unbalance and a higher harmonic can be compensated, and also it becomes possible to absorb the regeneration power from photovoltaics equipment etc. By moreover, the easy configuration which carries out the independent control of each phase of an inverter, without establishing independently an uninterruptible power source means and a sag compensation means It becomes possible to usually supply the power of quality to the distribution line of the one remaining phases, respectively about the power of

high quality with which sag was compensated for the power of the highest quality with which sag and interruption of service were compensated to the distribution line where the switching means was connected to the distribution line of one phase of other two phases.

[0010] Invention according to claim 3 is characterized by the above-mentioned switching means having a thyristor switch in the power supply according to quality according to claim 2.

[0011] According to invention of claim 3, there is an advantage which can simplify recovery action after interruption-of-service restoration of the distribution line where the thyristor switch concerned was connected by supplying a gate signal to a thyristor switch.

[0012]

[Embodiment of the Invention] Hereafter, the gestalt of implementation of this invention is explained with reference to a drawing. Drawing 1 is the important section circuit diagram showing the gestalt of the 1st operation of the power supply according to quality concerning this invention. The power supply according to this quality supplies the power according to quality to a single phase load by the power distribution system of three-phase four-wire system from a transformer 1, and connects to the distribution lines 2, 3; and 4 of the secondary three phase of a transformer 1 each alternating current output terminal of the inverter 5 of the three phase bridge configuration which used the solid state switch. Capacitors 7 and 7 are connected to an inverter 5, respectively between two input terminals by the side of the direct current, and the neutral-line way 6 of a three-phase-four-wire-system alternating current.

[0013] Moreover, rather than the node to the distribution lines 2, 3, and 4 of an inverter 5, by the load side, an uninterruptible power supply 8 is connected to the distribution line 2, and the sag compensator 9 is connected to the distribution line 3, respectively. The thing of a configuration of that the sag compensator 9 has a capacitor and a serial inverter is used for an uninterruptible power supply 8 using the thing of a configuration of having a rectifier, a rechargeable battery, and an inverter. An inverter 5, an uninterruptible power supply 8, and the sag compensator 9 are controlled using the output voltage of an uninterruptible power supply 8. In addition, although each phase voltage which uses 380V and a neutral-line way for an interphase voltage is shown in drawing 1 as 220V, this distribution-line electrical potential difference is an electrical potential difference currently carried out from the former in European countries, and is the electrical-potential-difference value operation will be assumed to be from increase of electrical-potential-difference need also in our country in the future.

[0014] While compensating the unbalance between three phases by controlling each phase of an inverter 5 independently according to the power supply according to quality shown in drawing 1 The power of the highest grace with which sag and interruption of service are compensated with an uninterruptible power supply 8 about the distribution line 2 is supplied compensating a higher harmonic. The high-definition power with which sag was compensated with the sag compensator 9 about the distribution line 3 can be supplied, and the power of grace can usually be supplied about the distribution line 4. In addition, it separates an inverter 5 from a network, using the solid state switch corresponding to each phase as off at the time of interruption-of-service compensation.

[0015] Drawing 2 is the important section circuit diagram showing the gestalt of the 2nd operation of the power supply according to quality concerning this invention. It is made for the power supply according to this quality to also absorb the regeneration power from the photovoltaics equipment installed in a home etc. For this reason, with the gestalt of this operation, the alternating current output terminal of the inverter 5 of a three phase bridge configuration is connected to the distribution lines 2, 3, and 4 of the secondary three phase of a transformer 1, and capacitors 7 and 7 and rechargeable batteries 11 and 11 are connected, respectively between two input terminals by the side of a direct current of this inverter 5, and the neutral-line way 6 of a three-phase-four-wire-system alternating current. Moreover, the thyristor switch 12 as a switching means is connected to a transformer 1 side rather than a node with an inverter 5 in the distribution line 2 which supplies the power of the highest quality. An inverter 5 and the thyristor switch 12 are controlled using the output voltage of the distribution line 2 to which the power of the highest quality is supplied.

[0016] Thus, by controlling each phase of an inverter 5 independently Absorbing regeneration power so that a head-tide style may be controlled with rechargeable batteries 11 and 11, at the same time it compensates the unbalance between a higher harmonic and a three phase with an inverter 5 The power of the highest grace with which sag and interruption of service are compensated about the distribution line 2 is supplied, the high-definition power with which sag was compensated about the distribution line 3 is supplied, and the power of grace is usually supplied about the distribution line 4. In addition, with the gestalt of this operation, the thyristor switch 12 is made off (it turns on in the usual operational status), the time of interruption-of-service compensation makes the solid state switch, therefore switching control of a phase corresponding to the distribution line 2 continue, and an inverter 5 separates the solid state switch of other phases from a network as off.

[0017] By according to the gestalt of this 2nd operation, connecting a capacitor 7 and a rechargeable battery 11 to juxtaposition between each of two input terminals by the side of a direct current of an inverter 5, and neutral-line ways 6, and controlling each phase of an inverter 5 independently Since the regeneration power absorption function and the uninterruptible power source function were given while performing unbalance, higher-harmonic compensation, and sag compensation, rather than the case of the gestalt of the 1st operation shown in drawing 1, configuration and control can be simplified and the whole can be made cheap.

[0018]

[Effect of the Invention] As mentioned above, according to invention according to claim 1, the alternating current of three-phase four-wire system is used. With an easy and cheap configuration [ say / connecting to the power distribution system the inverter and the uninterruptible power source means of having a capacitor, and a sag compensation means, and controlling each phase of an inverter independently ] The power of the highest grace with which sag and interruption of service were compensated, the high-definition power with which sag was compensated, and the power of usual grace can be supplied, respectively, compensating unbalance and a higher harmonic.

[0019] Moreover, the inverter which has a capacitor and a rechargeable battery in the power distribution system using the alternating current of three-phase four-wire system according to invention according to claim 2, With a easier and cheap configuration [ say / connecting a switching means and controlling each phase of an inverter independently ] The power of the highest grace with which sag and interruption of service were compensated, the high-definition power with which sag was compensated, and the power of usual grace can be supplied, respectively, absorbing the regeneration power from photovoltaics equipment etc., and compensating unbalance and a higher harmonic.

---

[Translation done.]

\* NOTICES \*

JPO and NCIPi are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

---

DESCRIPTION OF DRAWINGS

---

[Brief Description of the Drawings]

[Drawing 1] It is the circuitry Fig. of the important section of the gestalt of the 1st operation of the power supply according to quality concerning this invention.

[Drawing 2] Similarly, it is the circuitry Fig. of the important section of the gestalt of the 2nd operation.

[Description of Notations]

- 1 Transformer
- 2, 3, 4 Distribution line
- 5 Inverter
- 6 Neutral-Line Way
- 7 Capacitor
- 8 Uninterruptible Power Supply
- 9 Sag Compensator
- 11 Rechargeable Battery
- 12 Thyristor Switch

---

[Translation done.]

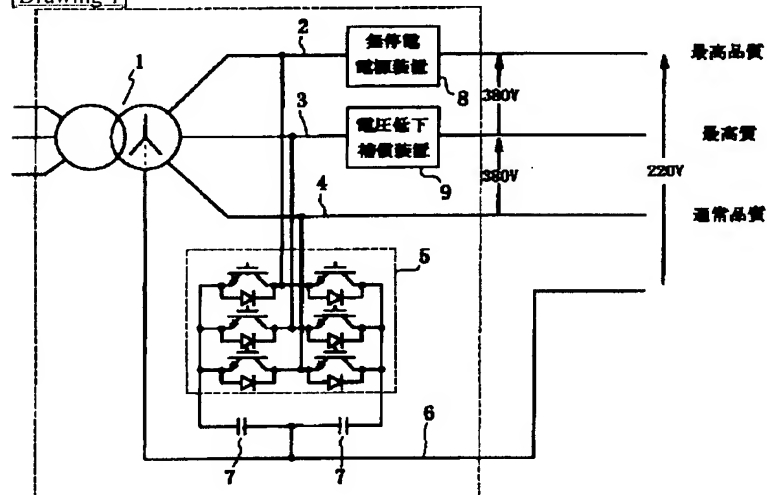
\* NOTICES \*

JPO and NCIPI are not responsible for any damages caused by the use of this translation.

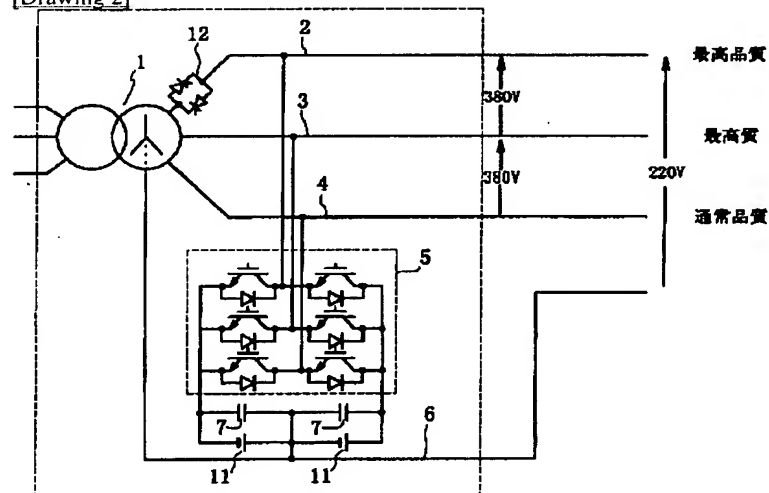
1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

## DRAWINGS

[Drawing 1]



[Drawing 2]



[Translation done.]

(19) 日本国特許庁 (J P)

(12) 特 許 公 報 (B 1)

(11) 特許番号

特許第2997782号

(P2997782)

(45) 発行日 平成12年1月11日(2000.1.11)

(24) 登録日 平成11年11月5日(1999.11.5)

(51) Int.Cl.

識別記号

F I

H 0 2 J 3/18

H 0 2 J 3/18

D

3/26

3/26

A

3/32

3/32

請求項の数3(全 5 頁)

(21) 出願番号 特願平11-27286

(22) 出願日 平成11年2月4日(1999.2.4)

審査請求日 平成11年2月4日(1999.2.4)

特許法第30条第1項適用申請有り 平成10年8月7日成  
蹊大学において開催された社団法人電気学会平成10年電  
力・エネルギー部門大会において発表

(73) 特許権者 391016945

大阪大学長

大阪府吹田市山田丘1番1号

(72) 発明者 辻 毅一郎

大阪府箕面市桜2丁目14-1-207

(72) 発明者 伊瀬 敏史

大阪府吹田市五月が丘東8-B-103

(74) 代理人 100059258

弁理士 杉村 暁秀 (外8名)

審査官 河合 弘明

(56) 参考文献 特開 平4-312318 (J P, A)

特開 昭61-221534 (J P, A)

特開 平8-98549 (J P, A)

特公 昭32-10736 (J P, B 1)

最終頁に続く

(54) 【発明の名称】 品質別電力供給装置

1

(57) 【特許請求の範囲】

【請求項1】 三相四線式交流の各相の配電線路に接続  
される交流出力端子を有する三相ブリッジ構成のインバ  
ータと、

このインバータの直流側の二個の入力端子と上記三相四  
線式交流の中性線路とのそれぞれの間に接続したコンデ  
ンサと、

上記インバータの配電線路への接続点よりも負荷側の所  
定の一相の配電線路に挿入され、当該配電線路の電圧低  
下を補償すると共に、停電時に当該配電線路に所定の電  
圧を給電する無停電電源手段と、

上記インバータの配電線路への接続点よりも負荷側の他  
の所定の一相の配電線路に挿入され、当該配電線路の電  
圧低下を補償する電圧低下補償手段とを有し、

上記インバータの各相を独立して制御して、中性線路と

2

各相の配電線路とのそれぞれの間に接続される単相負荷  
へ品質の異なる電力を供給するよう構成したことを特徴  
とする品質別電力供給装置。

【請求項2】 三相四線式交流の各相の配電線路に接続  
される交流出力端子を有する三相ブリッジ構成のインバ  
ータと、

このインバータの直流側の二個の入力端子と上記三相四  
線式交流の中性線路とのそれぞれの間に並列に接続した  
コンデンサおよび二次電池と、

10 上記インバータの配電線路への接続点よりも電源側の所  
定の一相の配電線路に挿入され、停電時に当該配電線路  
を遮断するスイッチ手段とを有し、

上記インバータの各相を独立して制御して、中性線路と  
各相の配電線路とのそれぞれの間に接続される単相負荷  
へ品質の異なる電力を供給するよう構成したことを特徴



3

とする品質別電力供給装置。

【請求項3】 上記スイッチ手段は、サイリスタスイッチを有することを特徴とする請求項2記載の品質別電力供給装置。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】この発明は、負荷の要求に即した品質の電力を供給する品質別電力供給装置に関するものである。

【0002】

【従来の技術】電気エネルギーは、取り扱いが容易であることから広く用いられており、現在非常に高品質に電力供給が行なわれている。しかしながら、負荷によっては、電熱用途など品質を要求しないが低コストを求めるもの、コンピュータなど瞬時の電圧低下や停電を許容できないものなど多様である。また、近年では、太陽光発電や風力発電などの自然エネルギー発電システムの普及、発送配電システムにおける規制緩和の傾向から、太陽光発電装置などが家庭に設置され、さらに太陽光発電装置などからの回生電力が配電系統に供給されるようになってきている。

【0003】このようなことから、配電系統の新しい考え方として、学会などから負荷の要求に即した品質の電力を供給する品質別電力供給方法が提案されている。

【0004】

【発明が解決しようとする課題】ところで、品質別電力供給を行なう場合には、それを実施するためのシステムのコストが問題となる。すなわち、発電所から送配電線を経て需要家に至る経路全てを品質別に対応させて複数設けると、システムのコストが極端に上昇し、それに伴って電力のコストも上昇することになる。また、太陽光発電装置などが増大するにつれて、逆潮流による配電線の電圧上昇や系統の周波数変動をも引き起こす恐れがある。さらに、非線形負荷のために、高調波電流が系統に流れて系統の電圧が歪む傾向にある。

【0005】この発明は、上述した配電系の諸問題を解決し、特に負荷の大多数を占める単相負荷に対して品質別電力を安価に供給できるよう適切に構成した品質別電力供給装置を提供することを目的とする。

【0006】

【課題を解決するための手段】上記目的を達成するため、請求項1に係る品質別電力供給装置の発明は、三相四線式交流の各相の配電線路に接続される交流出力端子を有する三相ブリッジ構成のインバータと、このインバータの直流側の二個の入力端子と上記三相四線式交流の中性線路とのそれぞれの間に接続したコンデンサと、上記インバータの配電線路への接続点よりも負荷側の所定の単相の配電線路に挿入され、当該配電線路の電圧低下を補償すると共に、停電時に当該配電線路に所定の電圧を給電する無停電電源手段と、上記インバータの配電線

4

路への接続点よりも負荷側の他の所定の単相の配電線路に挿入され、当該配電線路の電圧低下を補償する電圧低下補償手段とを有し、上記インバータの各相を独立して制御して、中性線路と各相の配電線路とのそれぞれの間に接続される単相負荷へ品質の異なる電力を供給するよう構成したことを特徴とするものである。

【0007】請求項1の発明によれば、インバータの各相を独立して制御することによって、各相の配電線路に対して不平衡および高調波を補償でき、さらに無停電電源手段が接続された配電線路に対しては電圧低下および停電を補償でき、また電圧低下補償手段が接続された配電線路に対しては電圧低下を補償することができる。したがって、無停電電源手段が接続された配電線路で最高品質の電力を、電圧低下補償手段が接続された配電線路で高品質の電力を、残りの単相の配電線路で通常品質の電力をそれぞれ供給することが可能となる。

【0008】請求項2に記載の品質別電力供給装置の発明は、三相四線式交流の各相の配電線路に接続される交流出力端子を有する三相ブリッジ構成のインバータと、このインバータの直流側の二個の入力端子と上記三相四線式交流の中性線路とのそれぞれの間に並列に接続したコンデンサおよび二次電池と、上記インバータの配電線路への接続点よりも電源側の所定の単相の配電線路に挿入され、停電時に当該配電線路を遮断するスイッチ手段とを有し、上記インバータの各相を独立して制御して、中性線路と各相の配電線路とのそれぞれの間に接続される単相負荷へ品質の異なる電力を供給するよう構成したことを特徴とするものである。

【0009】請求項2の発明によれば、インバータの直流側の二個の入力端子と三相四線式交流の中性線路とのそれぞれの間にコンデンサの他に二次電池を接続しているので、不平衡および高調波を補償できる他、太陽光発電装置等からの回生電力を吸収することが可能となる。また、無停電電源手段や電圧低下補償手段を独立して設けることなく、インバータの各相を独立制御する簡単な構成によって、スイッチ手段が接続された配電線路に対しては電圧低下および停電を補償した最高品質の電力を、他の二相の内の単相の配電線路に対しては電圧低下を補償した高品質の電力を、残りの単相の配電線路に対しては通常品質の電力をそれぞれ供給することが可能となる。

【0010】請求項3に記載の発明は、請求項2記載の品質別電力供給装置において、上記スイッチ手段は、サイリスタスイッチを有することを特徴とするものである。

【0011】請求項3の発明によれば、当該サイリスタスイッチが接続された配電線路の停電復旧後の回復動作をサイリスタスイッチにゲート信号を供給することにより簡単にできる利点がある。

【0012】

5

【発明の実施の形態】以下、図面を参照して、この発明の実施の形態について説明する。図1は、この発明に係る品質別電力供給装置の第1実施の形態を示す要部回路図である。この品質別電力供給装置は、変圧器1から三相四線式の配電系統によって単相負荷に品質別の電力を供給するもので、変圧器1の二次側の三相の配電線路2、3、4には、半導体スイッチを用いた三相ブリッジ構成のインバータ5のそれぞれの交流出力端子を接続する。インバータ5には、その直流側の二個の入力端子と、三相四線式交流の中性線路6との間にコンデンサ7、7をそれぞれ接続する。

【0013】また、インバータ5の配電線路2、3、4への接続点よりも負荷側で、配電線路2には無停電電源装置8を、配電線路3には電圧低下補償装置9をそれぞれ接続する。無停電電源装置8は、例えば整流器、二次電池およびインバータを有する構成のものを用い、電圧低下補償装置9は、コンデンサおよび直列インバータを有する構成のものを用いる。インバータ5、無停電電源装置8および電圧低下補償装置9は、無停電電源装置8の出力電圧を用いて制御する。なお、図1には、相間電圧を380V、中性線路を用いる各相電圧を220Vとして示しているが、この配電線電圧は従来から欧州各国で実施されている電圧で、我が国においても電圧需要の増大から将来実施が想定される電圧値である。

【0014】図1に示す品質別電力供給装置によれば、インバータ5の各相を独立して制御することにより、三相間の不平衡を補償すると共に、高調波を補償しながら、配電線路2については無停電電源装置8により電圧低下および停電を補償する最高品位の電力を供給し、配電線路3については電圧低下補償装置9により電圧低下を補償した高品位の電力を供給し、配電線路4については通常品位の電力を供給することができる。なお、停電補償時は、インバータ5は各相に対応する半導体スイッチをオフとして系統から切り離す。

【0015】図2は、この発明に係る品質別電力供給装置の第2実施の形態を示す要部回路図である。この品質別電力供給装置は、家庭等に設置される太陽光発電装置等からの回生電力をも吸収するようにしたものである。このため、この実施の形態では、変圧器1の二次側の三相の配電線路2、3、4に三相ブリッジ構成のインバータ5の交流出力端子を接続し、このインバータ5の直流側の二個の入力端子と、三相四線式交流の中性線路6との間にコンデンサ7、7および二次電池11、11をそれぞれ接続する。また、最高品質の電力を供給する配電線路2には、インバータ5との接続点よりも変圧器1側にスイッチ手段としてのサイリスタスイッチ12を接続する。インバータ5およびサイリスタスイッチ12は、最高品質の電力が供給される配電線路2の出力電圧を用いて制御する。

【0016】このようにして、インバータ5の各相を独

6

立して制御することにより、インバータ5で高調波および三相間の不平衡を補償すると同時に、二次電池11、11で逆潮流を抑制するように回生電力を吸収しながら、配電線路2については電圧低下および停電を補償する最高品位の電力を供給し、配電線路3については電圧低下を補償した高品位の電力を供給し、配電線路4については通常品位の電力を供給する。なお、この実施の形態では、停電補償時は、サイリスタスイッチ12をオフとし（通常の運転状態ではオン）、インバータ5は配電線路2に対応する相の半導体スイッチについてはスイッチング制御を継続させ、他の相の半導体スイッチはオフとして系統から切り離す。

【0017】この第2実施の形態によれば、インバータ5の直流側の二個の入力端子と中性線路6とのそれぞれ間に並列にコンデンサ7および二次電池11を接続し、インバータ5の各相を独立して制御することにより、不平衡・高調波補償および電圧低下補償を行なうと共に、回生電力吸収機能および無停電電源機能を持たせるようにしたので、図1に示した第1実施の形態の場合よりも、構成および制御を簡単にでき、全体を安価にできる。

【0018】

【発明の効果】以上のように、請求項1記載の発明によれば、三相四線式の交流を用い、その配電系統にコンデンサを有するインバータ、無停電電源手段、電圧低下補償手段を接続し、インバータの各相を独立して制御するという、簡単かつ安価な構成で、不平衡・高調波を補償しながら、電圧低下・停電を補償した最高品位の電力、電圧低下を補償した高品位の電力、および通常品位の電力をそれぞれ供給することができる。

【0019】また、請求項2記載の発明によれば、三相四線式の交流を用い、その配電系統にコンデンサおよび二次電池を有するインバータ、スイッチ手段を接続し、インバータの各相を独立して制御するという、より簡単かつ安価な構成で、太陽光発電装置等からの回生電力を吸収し、かつ不平衡・高調波を補償しながら、電圧低下・停電を補償した最高品位の電力、電圧低下を補償した高品位の電力、および通常品位の電力をそれぞれ供給することができる。

【図面の簡単な説明】

【図1】 この発明に係る品質別電力供給装置の第1実施の形態の要部の回路構成図である。

【図2】 同じく、第2実施の形態の要部の回路構成図である。

【符号の説明】

- 1 変圧器
- 2, 3, 4 配電線路
- 5 インバータ
- 6 中性線路
- 7 コンデンサ

8 無停電電源装置

9 電圧低下補償装置

11 二次電池

12 サイリスタスイッチ

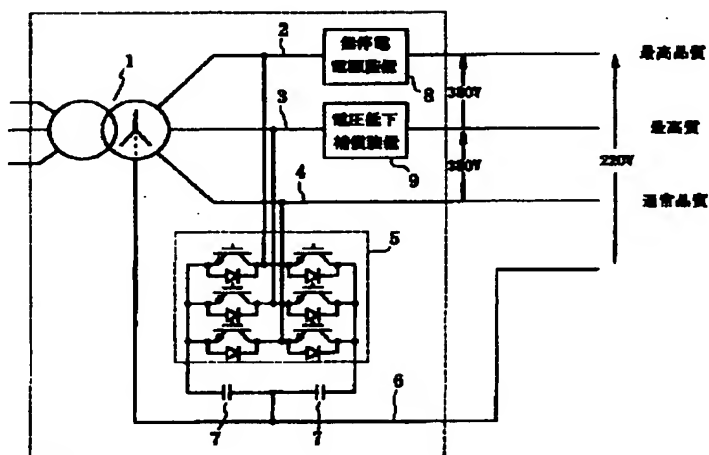
【要約】

【課題】 特に負荷の大多数を占める単相負荷に対して品質別電力を安価に供給できる品質別電力供給装置を提供する。

【解決手段】 三相四線式交流の各相の配電線路2, 3, 4に接続される交流出力端子を有する三相ブリッジ10構成のインバータ5と、このインバータ5の直流側の二

個の入力端子と中性線路6とのそれぞれの間に接続したコンデンサ7, 7と、インバータ5の配電線路への接続点よりも負荷側の所定の一相の配電線路2に挿入され、配電線路2の電圧低下・停電を補償する無停電電源手段8と、インバータ5の配電線路への接続点よりも負荷側の他の所定の一相の配電線路3に挿入され、配電線路3の電圧低下を補償する電圧低下補償手段9とを有し、インバータ5の各相を独立して制御して、中性線路6と配電線路2, 3, 4とのそれぞれの間に接続される単相負荷へ品質の異なる電力を供給するよう構成する。

【図1】



【図2】

